FIG. 1

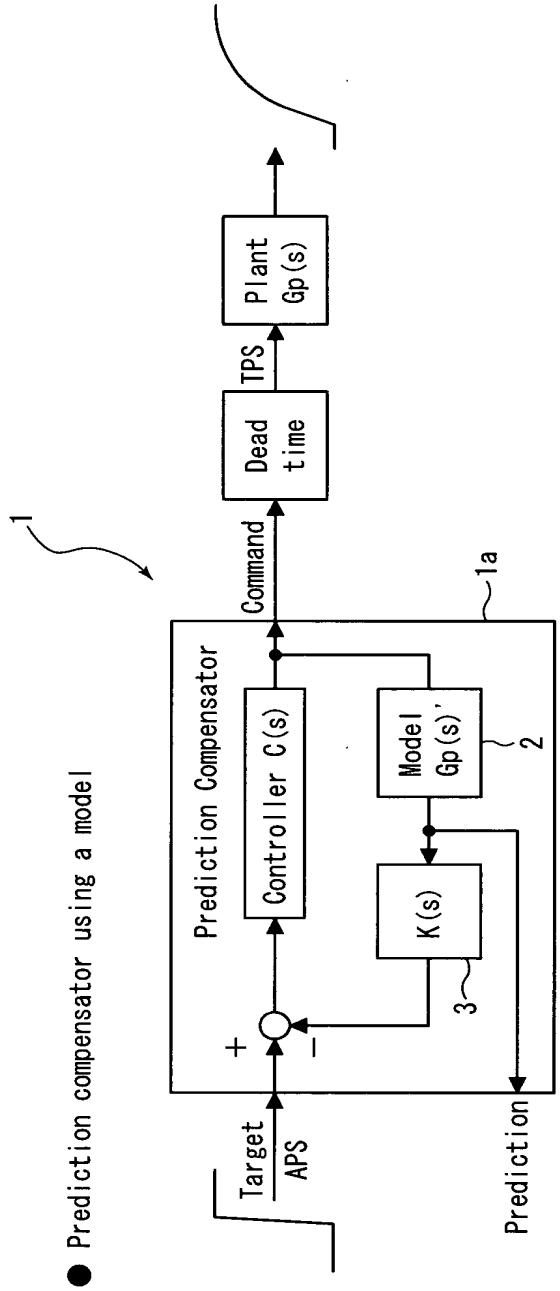

● Prediction compensator using a model
1
Target
APS
+
−
Prediction Compensator
Controller C(s)
Command
Model Gp(s)'
2
K(s)
3
1a
Dead time
TPS
Plant Gp(s)
Prediction

FIG. 2

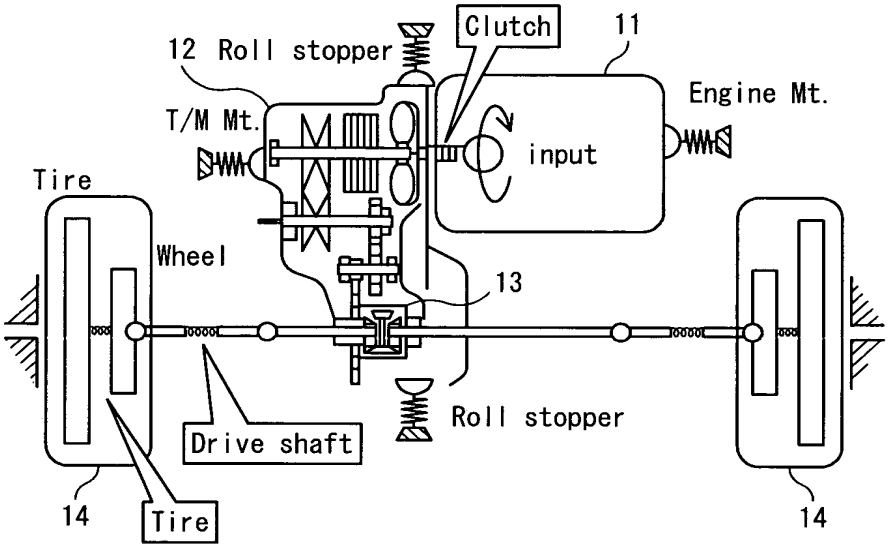
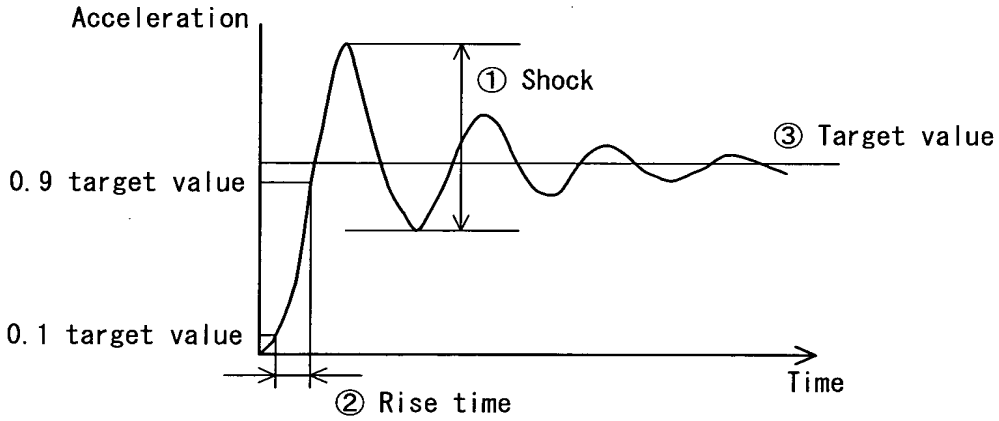
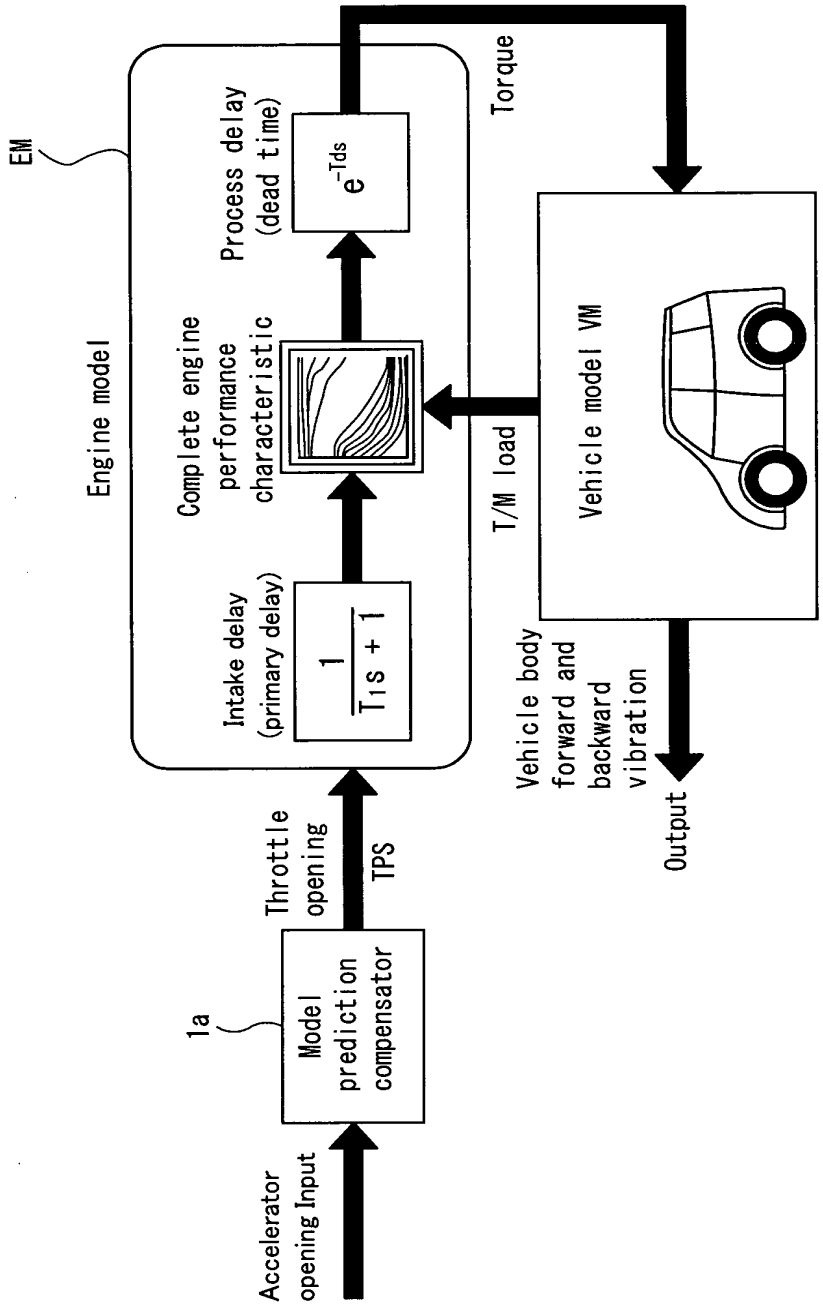


FIG. 3



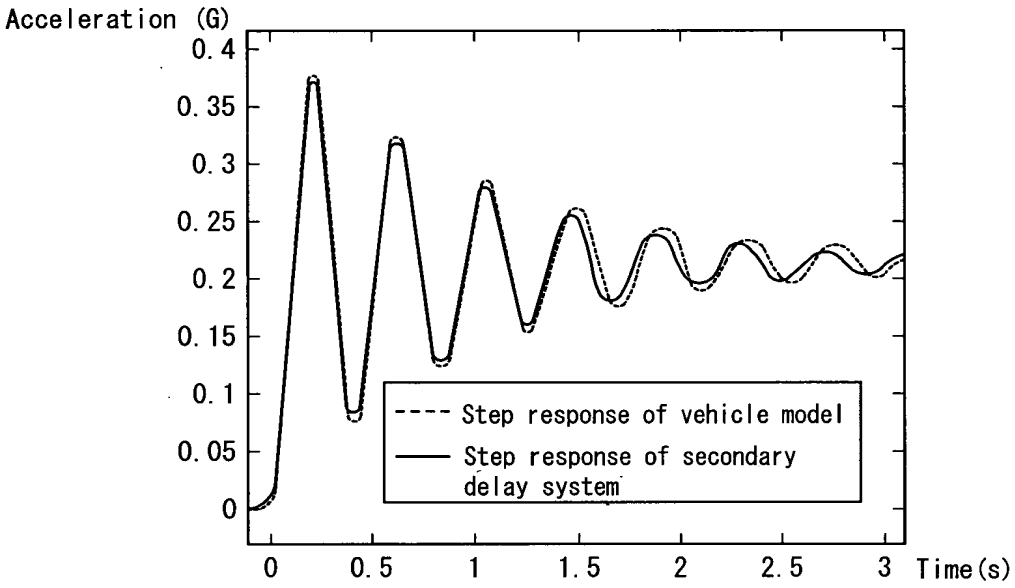
Determination of a target acceleration

FIG. 4



Outline of a simulation model

FIG. 5



Approximation of a high-order system to a secondary system

FIG. 6

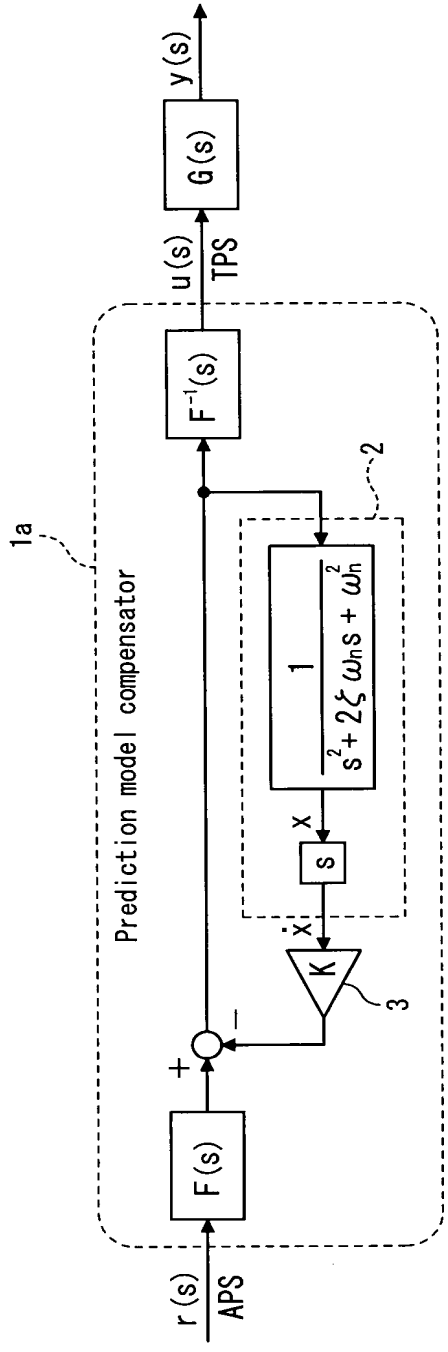
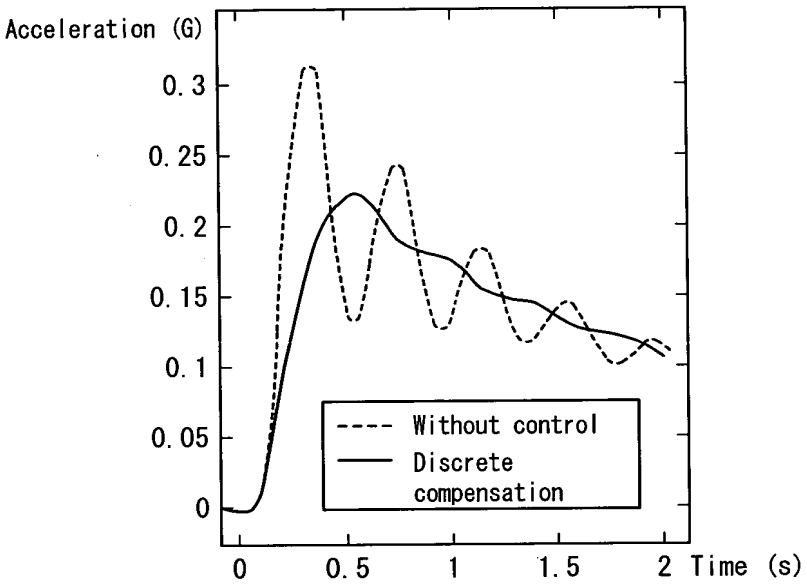
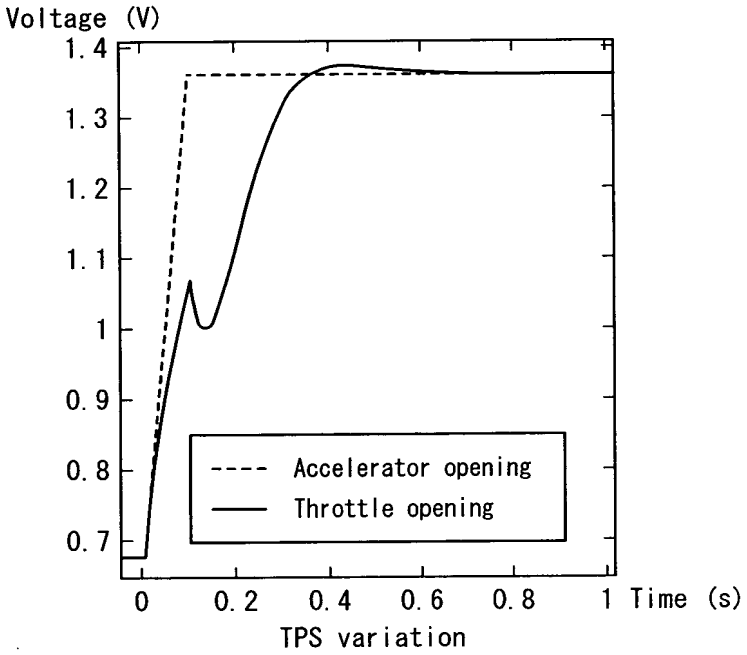

y(s)
G(s)
u(s)
TPS
$F^{-1}(s)$
2
1a
Prediction model compensator
$\frac{1}{s^2+2\zeta\omega_n s+\omega_n^2}$
x
s
$\dot{x}$
K
3
+
−
F(s)
r(s)
APS

FIG. 7



Vehicle body forward and backward vibration variation

FIG. 8



TPS variation

FIG. 9

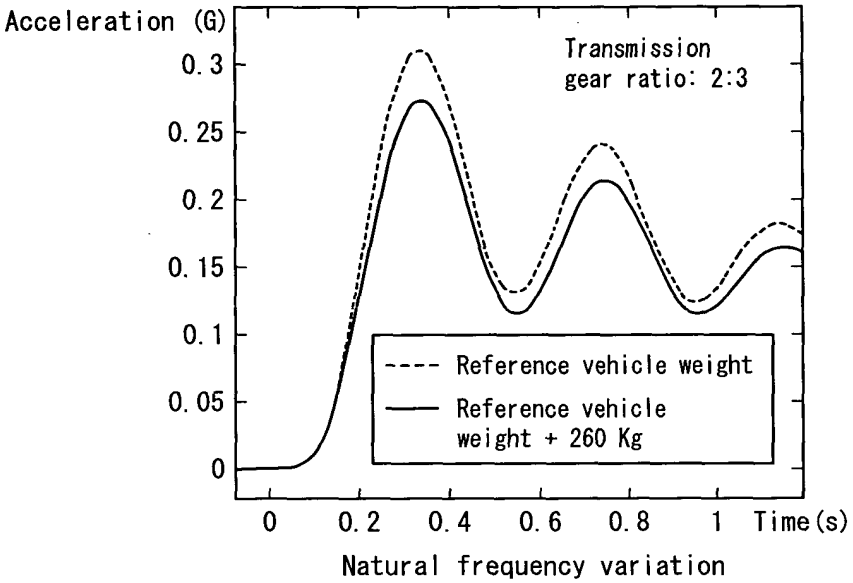

Acceleration (G)
0.3
0.25
0.2
0.15
0.1
0.05
0
Transmission gear ratio: 2:3
Reference vehicle weight
Reference vehicle weight + 260 Kg
0
0.2
0.4
0.6
0.8
1
Time(s)
Natural frequency variation

FIG. 10

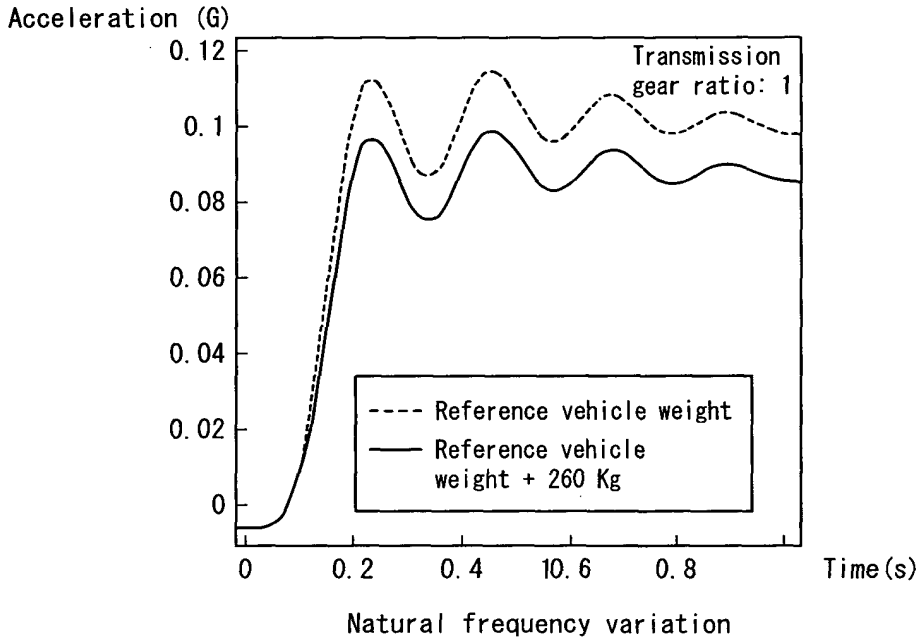

Acceleration (G)
0.12
0.1
0.08
0.06
0.04
0.02
0
Transmission gear ratio: 1
Reference vehicle weight
Reference vehicle weight + 260 Kg
0
0.2
0.4
10.6
0.8
Time(s)
Natural frequency variation

FIG. 11

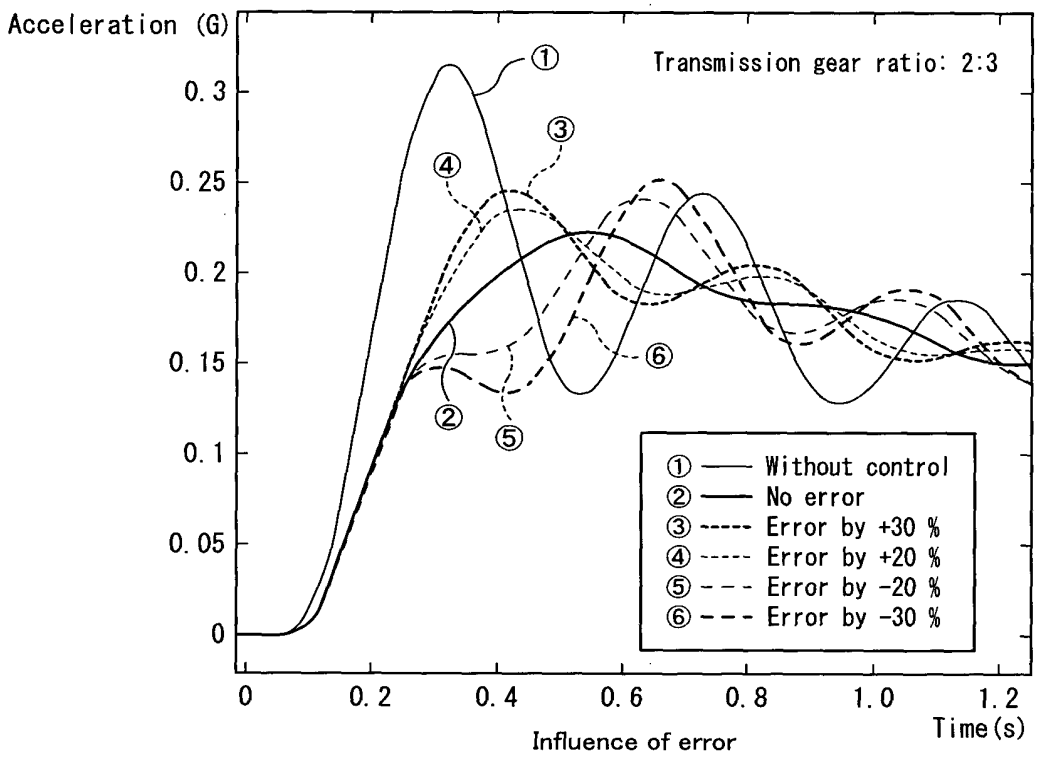
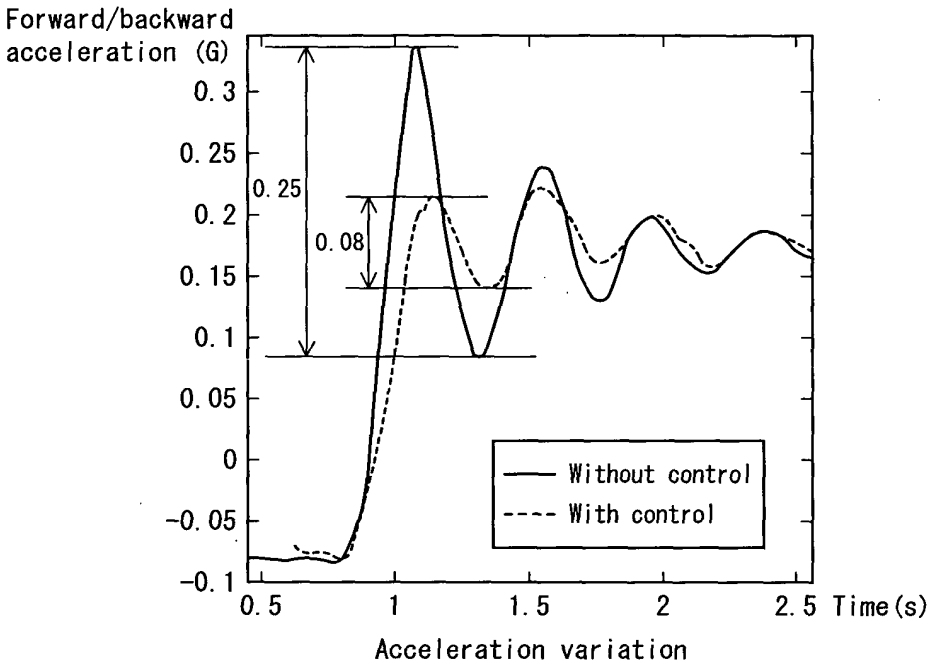
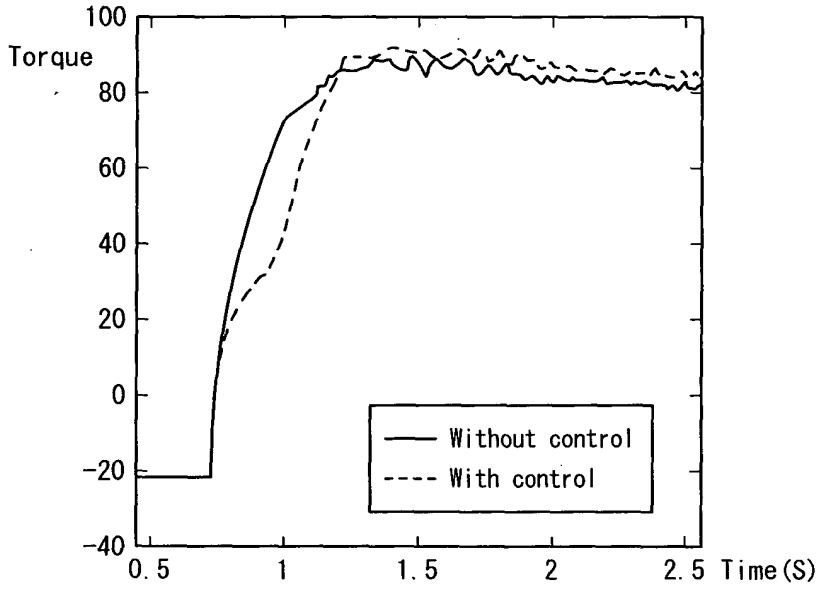

Acceleration (G)
0.3
0.25
0.2
0.15
0.1
0.05
0
Transmission gear ratio: 2:3
①
②
③
④
⑤
⑥
① —— Without control
② —— No error
③ ----- Error by +30 %
④ ----- Error by +20 %
⑤ - - - Error by -20 %
⑥ - - - Error by -30 %
0
0.2
0.4
0.6
0.8
1.0
1.2
Time (s)
Influence of error

FIG. 12



Acceleration variation

FIG. 13



Engine torque variation

FIG. 14

◎K map 1: the gain k varies in response to the speed of the on-line model

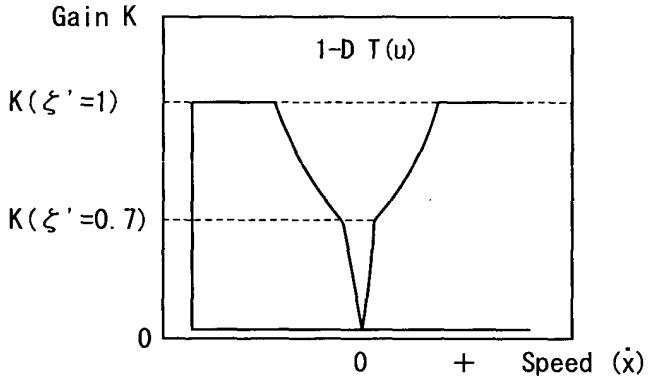


FIG. 15

◎ K map 2: K map 1 + presence of a dead zone

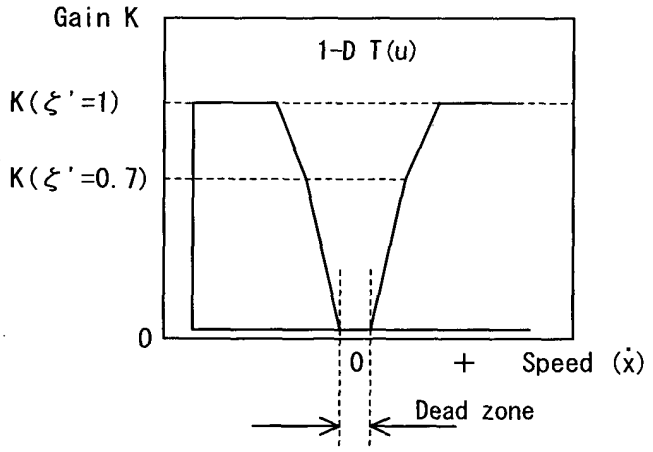


FIG. 16

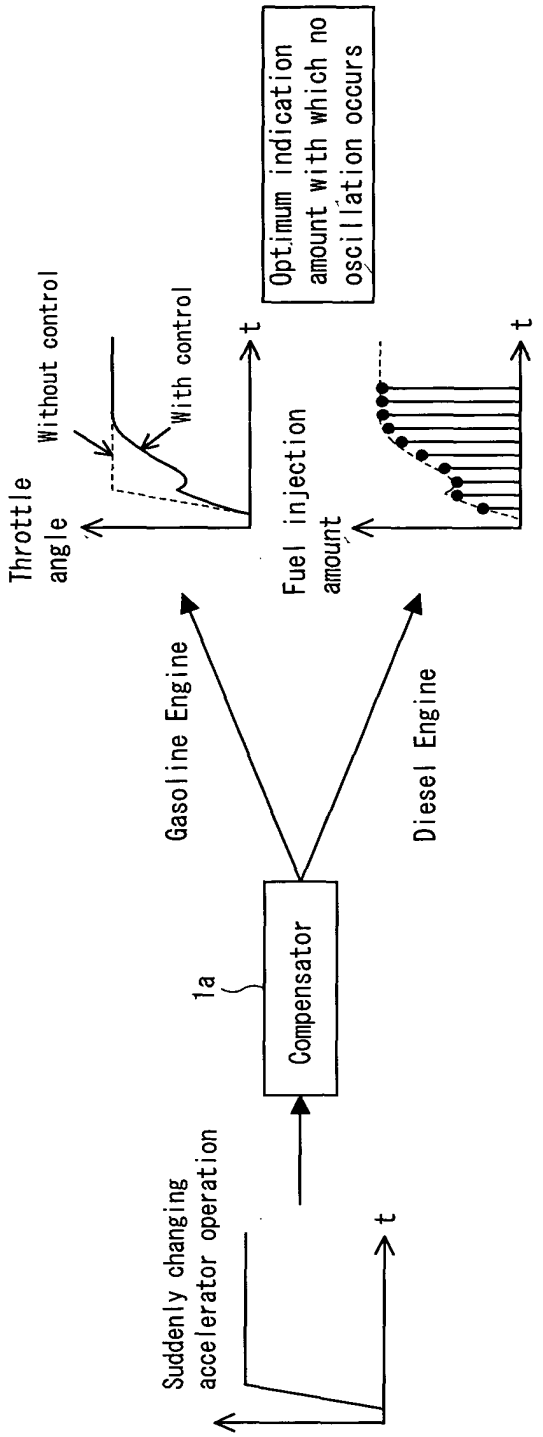
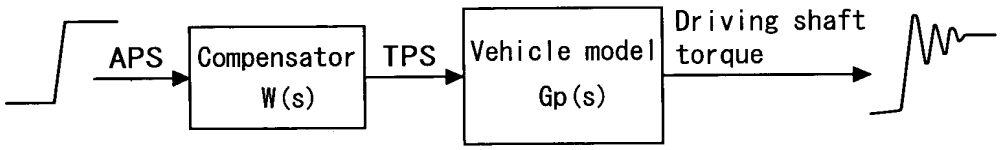

Optimum indication amount with which no oscillation occurs
Without control
With control
Throttle angle
t
Fuel injection amount
t
Gasoline Engine
Diesel Engine
1a
Compensator
Suddenly changing accelerator operation
t

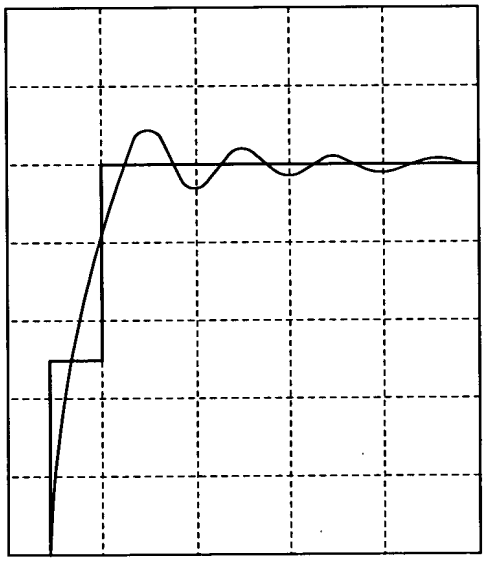
FIG. 17



$$Gp(s) = \frac{K\omega_p^2}{(s^2 + 2\zeta_p\omega_p s + \omega_p^2)}$$

$$W(s) = \frac{\omega_m^2(s^2 + 2\zeta_p\omega_p s + \omega_p^2)}{\omega_p^2(s^2 + 2\zeta_m\omega_m s + \omega_m^2)}$$

FIG. 18



Vibration suppression
by a two-stage step instruction